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ABSTRACT

Student-centered learning environments provide interactive, complimentary activities that enable individuals to address their unique learning interests and needs, examine content at multiple levels of complexity, and deepen understanding. This paper provides a brief overview of learning environments and identifies the foundations and underlying assumptions of learning environments. Learning environments are rooted in five foundations: psychological, pedagogical, technological, cultural, and pragmatic. The five foundations are functionally integrated in learning systems designs. The better integrated the foundations, the greater probability of success in the setting for which it is designed. Student-centered learning environments are rooted in several assumptions. These assumptions are based on a synthesis of empirical research, theory, and supporting examples and represent how the learner, knowledge, and structure of the environment are conceptualized. A table presents 11 assumptions and functions of student-centered learning environments. (Contains 17 references.) (AEF)

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Student-Centered Learning Environments: Foundations, Assumptions, and Implications

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Introduction

Traditional instructional approaches, as well as the systems design processes that support them, have been criticized for failing to reflect contemporary thinking about teaching, learning, and technology. Several perspectives have emerged regarding the role of instructional systems design in supporting critical thinking and problem solving. Many believe that instructional design methodologies, themselves, are not inherently limiting. Limitations, it is argued, result from narrow interpretation rather than inherent shortcomings in the approaches themselves (Reigeluth, 1989). Others advocate extending or adapting traditional design methodologies to better accommodate diverse perspectives and contemporary research and theory (Lebow, 1993; Rieber, 1992). Still others disagree, noting that many objectivist assumptions and pedagogical requirements of "instruction" are fundamentally incompatible with non-objectivist viewpoints (Cunningham, 1987; Kember & Murphy, 1990). The need for enlightened uses of technology to support alternative approaches is apparent. Student-centered learning environments have been touted as one alternative.

Student-centered learning environments provide interactive, complimentary activities that enable individuals to address their unique learning interests and needs, examine content at multiple levels of complexity, and deepen understanding (Hannafin, 1992). Contemporary environments create multidimensional, ecologically valid systems where students access existing, or build new, conceptual linkages. They establish conditions that enrich thinking and learning, and use technology to enable a multitude of methods through which the processes can be supported.

Unfortunately, research on the many forms of computerized learning environments has been sparse. Empirically-based design guidelines have rarely been offered, resulting in a host of diverse applications of technology but not what Glaser (1976) described as a "science of design." The purposes of this paper are to provide a brief overview of learning environments and to identify the foundations and underlying assumptions of learning environments.

Overview

The concept of a learning environment is not new. Its roots can be traced to early apprenticeship, Socratic, and similar movements that have sought to immerse individuals in authentic learning experiences, where the meaning of knowledge and skills are realistically embedded (Dewey, 1933; Pask & Boyd, 1987). Recent perspectives have expanded, seeking to change the nature and breadth of experiences made available to learners and in the capacity to mediate these experiences electronically (Papert, 1993). Designers have operationalized learning systems of enormous power and sophistication based upon redefined notions of learner-knowledge relationships. Contemporary learning systems reflect research and theory ranging from situated, contextual teaching and learning (Brown, Collins & Duguid, 1989; Cognition and Technology Group at Vanderbilt, 1992) to cognitive flexibility (Spiro, Feltovich, Jacobson, & Coulson, 1991). Comparatively few applications, however, have unleashed the potential of either the technologies or learners. A need to optimize the capabilities of both emerging technologies and learners is apparent. A clearer understanding of the roots of alternative approaches is needed.

Foundations of Learning Environments

Various learning environments can be classified according to the manner in which they manifest their underlying foundations. Learning environments are rooted in five foundations: Psychological, pedagogical, technological, cultural, and pragmatic. All learning environments explicitly or tacitly reflect these underlying models or foundations.

Psychological foundations are rooted in beliefs about how individuals think and learn. Contemporary learning environments draw upon psychological foundations from areas such as constructivism (Jonassen, 1991), situated learning (Brown, Collins, & Duguid, 1989), and cognitive psychology (APA, 1992). Pedagogical foundations, on the other hand, emphasize how knowledge is conveyed. Pedagogical influences focus on the methods, activities, and structures of the learning environment. Student-centered learning environments often draw upon pedagogical approaches such as problem-based contexts (CTGV, 1992), and opportunities for experimentation and exploration (Tobin & Dawson, 1992). Taken together, psychological and pedagogical foundations provide the basis for the methods and strategies employed, and the ways in which the to-be-learned content is organized.

When technological foundations are considered, they emphasize how the capabilities and limitations of available technology can be optimized to create an environment likely to engender the kinds of learning desired. Technological capabilities constrain or enhance the types of learner-system transactions that are possible. The challenge for designers is to capitalize on the capabilities of emerging technologies, while generating new designs rooted in emerging psychological and pedagogical research and theory.

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Cultural foundations reflect prevailing beliefs about education, values of the culture, and the roles that individuals play in society. In turn, they affect the design of learning systems by forming the underlying value systems that guide design methodologies. For instance, both educators and society recognize the need for educational system that adequately meet the knowledge requirements of our rapidly expanding technological society. Computers are prevalent in most classrooms and educational software is widely available -- schools are beginning to mirror the values and priorities of a technological society.

Pragmatic foundations reflect the practical constraints of the environment. Each setting has unique situational constraints that affect the design of learning systems. Issues such as run-time requirements, hardware/software availability, and financial concerns significantly influence the adoption and diffusion of innovations. They emphasize the practical reasons a particular approach should or should not, or can or cannot, be used in a learning environment.

The five foundations are functionally integrated in learning systems designs. The better integrated the foundations, the greater probability of success in the setting for which it is designed. However, if one or more of the foundations is not conceptualized in conjunction with the others, complete integration is not possible. For instance, an environment rooted primarily in technological capabilities (e.g., the use of the Internet in the classroom) may be limited in that it excludes consideration of other foundations; attention must also focus on how technology can support desired thinking, convey information, reflect cultural beliefs, and meet pragmatic requirements. As shown in Figures 2a - 2d, failure to account for all foundations interactively causes predictable threats to the integrity of the environment.

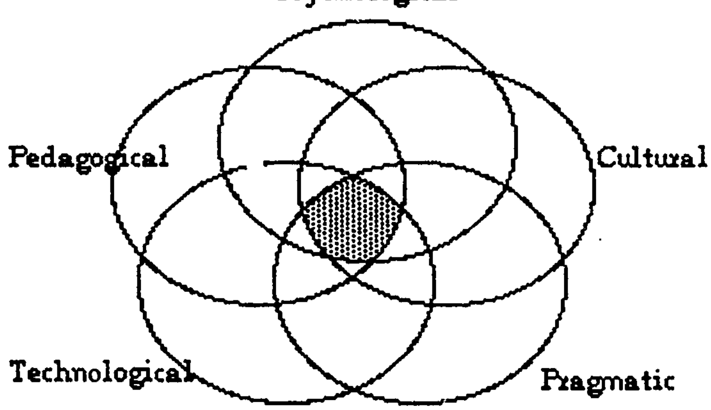
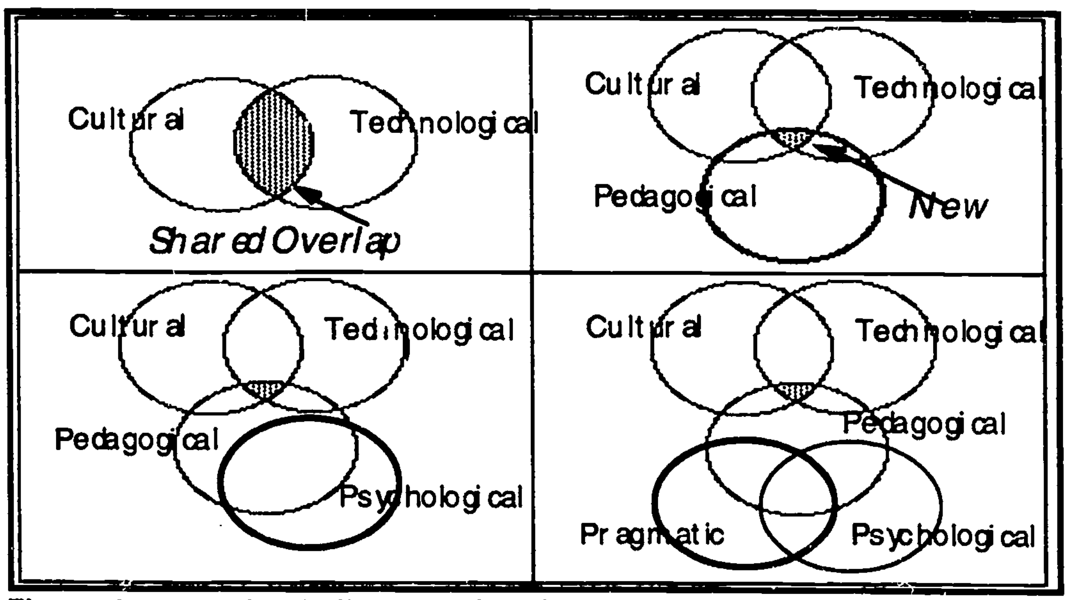


Figure 1: An integrated environment



Figures 2.2a - 2.2d: A disconnected environment

The underlying assumptions determine how (or if) the information within each of the foundations will be connected in a learning environment. This is true regardless of specific biases and perspectives. For instance, objectivists draw upon a subset of philosophies, methods, and technological activities that are uniquely appropriate to their underlying assumptions. Constructivists reference the same foundation pool, but derive distinctly different strategies based upon altered underlying assumptions. The underlying assumptions, then, dictate how the foundations will be operationalized in any environment. As the assumptions vary, the foundations, and hence the features and methods, of the learning environment change accordingly.

Assumptions of Student-Centered Learning Environments

Student-centered learning environments comprise many forms, often with few apparent similarities. Isolated student-centered environments in science, mathematics, social science, literature, and other domains have prompted educators to explore the structure, goals, and perspectives of student-centered systems. The efforts, however, often appear dissimilar in functions, goals, and features, thus making it difficult to identify general design principles. Despite such variations, common assumptions have been identified and are manifested either explicitly or implicitly within the environment (Hannafin et al., 1994).

Student-centered learning environments are rooted in several assumptions. These assumptions are based on a synthesis of empirical research, theory, and supporting examples-- primarily from areas such as situated cognition, microworld design, mental model development, metacognition, and process learning. These assumptions represent how the learner, knowledge, and structure of the environment are conceptualized. While a complete treatment of the differences is not possible here, several critical assumptions and accompanying functions of student-centered learning environments can be identified. Table 1 summarizes the assumptions with supporting functions.

Table 1: Assumptions and Functions of Student-Centered Learning Environments

Assumption	Functions
Instruction, as traditionally defined, is too narrow to support varied ways of promoting learning	• Allows learners to "make sense" out of what they know. • Supports meta-knowledge about problem solving. • Encourages deeper understanding and theory building.
Activities must focus on the underlying cognitive processes-- not solely products of learning	• Increases meaningful learning and connections among ideas. • Combats rote memory and disassociation of knowledge. • Supports learning of self-regulation and meta-knowledge.
Knowledge is dynamic and continuously evolving	• Supports learners in building upon intuitions or mental models. • Understanding is refined through experience and exploration. • Addresses compliance vs. evaluation of knowledge issue.
Individuals must assume a greater responsibility for their own learning	• Encourages unique sense making capabilities of learners. • Supports learning of self-regulation skills. • Supports active learning and individual construction of knowledge.
Learners perform best when varied/multiple representations are supported	• Conceptual diversity requires varied representations and activities. • The potential for complex understanding increases as the environment becomes rich and engaging. • Supports multiple perspectives and flexible understanding.
Learning is best when rooted in relevant contexts	• Orients learners to inter-relatedness of knowledge. • Learner uses knowledge as a "tool". • Cognitive process and context are inextricably tied.
Learning is most relevant when rooted in personal experience	• Thinking originates from personal experience. • Normally abstract notions can be experienced and manipulated. • Learners develop insights into the "why" behind experiences.

Table 1. (continued)

Assumption	Function
Reality is not absolute, but is a personal by-product of context, interpretation, and negotiation.	• Learners formulate and modify initial understanding. • Errors are useful as data for refining understanding. • Wisdom cannot be "told."
Understanding requires time	• Understanding must be cultivated and not described. • Understanding is deeper when learners "get to know" and explore it. • Understanding transcends the information given.
Understanding is best supported when processes are augmented, not supplanted, by technology.	• Allows novices to become familiar with complex notions without excessive cognitive load. • Engages learners in complex ideas/problems encountered by experts. • Leads to understanding that surpasses what could be achieved without support.
Learners make, or can be guided to make, effective choices	• Supports development of learner's "need to know" information. • Establishes an "anchor" upon which further information can be added • Learners see errors as a cue for further information in process of working towards a goal.

Conclusions

Advances in technology have enabled the development of a range of learning environments. These environments reflect diverging views about the nature of knowledge and understanding, the role of learners, and the manner in which learning environments should be structured. This paper has identified underlying assumptions and relevant foundations for a particular group of approaches--student-centered, computer-enhanced learning environments--that manifest similar features and attributes. Based upon the underlying beliefs of student-centered learning, the value of the environment can be optimized based upon foundations that are not only consistent with, but a direct manifestation of, the assumptions.

It is important to recognize that viable alternatives to traditional instructional methodologies exist, alternatives that are rooted in different assumptions and draw upon different research and theory bases than do traditional approaches. The shifts are fundamental, not cosmetic or semantic, in nature. The issue is not simply one of emphasizing similarities across approaches, but comprehending the differences in assumptions and foundations that underlie them. It is unlikely that renaming traditional processes, without altering basic beliefs about the processes themselves, will significantly alter the nature of the learning environment. Indeed, in many cases, traditional methods have been largely unsuccessful in promoting the kinds of critical thinking and problem-solving widely sought. If we aim to address sophisticated learning goals involving in-depth study, problem solving, and reasoning, alternative assumptions, foundations, and methods must be considered.

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